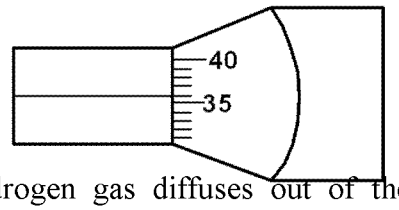
NTIMA, NYAKI AND MUNICIPALITY CLUSTER EVALUATION 2016

PHYSICS
Paper 1
July/August 2016
MARKING SCHEME

SECTION A :

1.



2. Hydrogen gas diffuses out of the pot at a faster rate than air gets in. ✓1
Pressure in the pot reduces below the atmospheric pressure✓1. Hence the greater atmospheric pressure on the surface of the water pushes the water up the tube. ✓1

3. a) Thermometer x shows a higher reading ✓1
b) The black painted surface radiates heat at a faster rate than the white surface ✓1

4. The cohesion force between the water molecules is greater than adhesion force between water molecules and the waxed glass surface ✓1

5.

	or	
$F = Ke$ ✓1		$F = Ke$
$e = e_1 + e_2$		$e = e_1 + e_2$
$\frac{90}{3k} + \frac{90}{2k} = 0.25$ ✓1		$0.25 = \frac{30}{k} + \frac{45}{k}$ ✓1
$K = 300N/m$ ✓1		$k = 300N/m$ ✓1

6. The fixed points are ice point / lower fixed point and steam point / upper fixed point ✓1
The lower fixed points in the Celsius scale is the temperature of pure melting ice at standard atmospheric pressure while the upper fixed point is the temperature of steam from pure boiling water at standard atmospheric pressure ✓1

7. Clockwise moment = anticlockwise moment ✓1
or $F_1S_1 = F_2S_2$ or $F_1d_1 = F_2d_2$
$6(0.35 - x) = 3x + (0.2 + x)4$ ✓1
$x = 0.1m$
The position the pivot is at 40cm marks

8. Resultant force (force causing the motion)
$F = ma$
$= 10 \times 16$
$= 160N$ ✓1
Friction $= 200 - 160$
$= 40N$
$F = \mu R = \mu mg$ ✓1 either formula or substitution
$\mu = \frac{40}{100}$
$= 0.4$ ✓1

9. The velocity of the body reduces uniformly upto the maximum height when it is momentarily at rest ✓1
Then the velocity increases uniformly in the opposite direction ✓1

10. To increase the area of the contact with the ground inorder to reduce the pressure ✓1

11. $T = \frac{mv^2}{r} - mg$ ✓
$= \frac{0.2 \times 12^2}{0.48} - 0.2 \times 10$ ✓
$= 58N$ ✓

12. Pressure reduces ✓1

SECTION B

13. a) i) $V = \frac{m}{}$ $m = 70.12 - 70 = 0.12$
$= \frac{0.12}{0.75}$ either substitution or formula

$= 0.16cm^3$ ✓1

ii) Volume of one drop $= \frac{0.16}{80}$ ✓1

$= 0.002cm^3$ ✓1

b) i) $V = h \times A$ ✓1

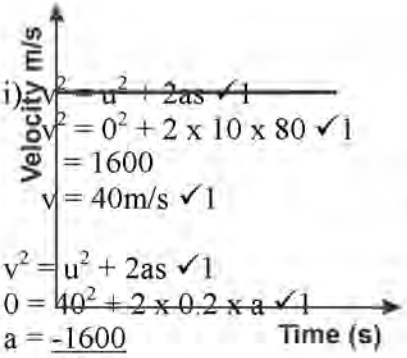
$h = \frac{0.002}{^{22}/_7 \times 50 \times 50}$ ✓1

$= 2.545 \times 10^{-7}cm$ ✓1

ii) Mono molecular layer of oil forms the patch ✓1

14. a) The velocity of a body changes equally at equal time intervals ✓1

b)



✓1

c) i) ~~$v^2 = u^2 + 2as$ ✓1~~

$v^2 = 0^2 + 2 \times 10 \times 80$ ✓1

$= 1600$

$v = 40m/s$ ✓1

ii) $v^2 = u^2 + 2as$ ✓1

~~$0 = 40^2 + 2 \times 0.2 \times a$ ✓1~~

$a = \frac{-1600}{0.4}$

$= -4000m/s^2$ ✓1

iii) Retarding force $F = ma$ ✓

$= 0.5 \times 4000$ either formula or substitution

$= 2000N$ ✓1

15. a) i) Energy can neither be created nor destroyed but can be transformed from one form to another ✓1

b) i) At P the bob has P.E which is converted to KE between P and Q, ✓1 then from K.E to P.E between Q and R ✓1

ii) $\frac{1}{2}mv^2 = mgh$ ✓1

$v = \sqrt{0.072 \times 2 \times 10}$ ✓1

$= 1.2m/s$ ✓1

c) i) Work = force x distance

$= 2 \times 40$

$= 80J$

ii) work done by effort

$w = 4 \times 30$

$= 120J$

iii) Efficiency $= \frac{\text{work output}}{\text{work input}} \times 100\%$

$= \frac{80}{120} \times 120\%$

$= 66.67\%$

16. a) i) Charle's law ✓1

ii) I. To trap air ✓1

II. Dry the air ✓1

iii) To warm / heat the trapped air ✓1

iv) I. volume / length of air column ✓1

II. Temperature of the water bath or trapped air ✓1

b) Draw the graph of volume / length of trapped air against absolute temperature ✓1

The graph is a straight line ✓1 showing that volume is directly proportional to absolute temperature ✓1

b) $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ ✓1

$V_2 = \frac{30 \times 291}{327}$ ✓1

$= 26.697cm^3$

$= 26.7cm^3$ ✓

17. i) Slope $= \frac{\text{charge in Y}}{\text{charge in X}}$

$= \frac{0.5 - 0.2}{(4 - 1.6)\ 10^{-2}}$ ✓1 ✓1

$= 12.5$ ✓1

ii) $u = Ah \quad g$ ✓

slope $= a \quad g$

$12.5 = 6.25 \times 10^{-4} \times \quad \times 10$ ✓

$= \frac{12.5}{6.25 \times 10^{-4} \times 10}$

$= 2000kg/m^3$ ✓

18. i) $Q = ml + MC\Delta\theta$ ✓
$Q = 0.006L + 0.006 \times 4200 \times (100 - 24.4)$
$Q = 0.006L + 1905.12$ ✓

ii) $H = MC\Delta\theta$ ✓
$H = 0.4 \times 4200 \times (24.4 - 15)$
$H = 15792J$ ✓

iii) $0.006L + 1905.12 = 15792$ ✓
$0.006L = 15792 - 1905.12$
$L = \frac{15792 - 1905.12}{0.006}$
$= 2.314 \times 10^{6} Jkg^{-1}$ ✓